CALCULATION COVER SHEET

MANAGERS **DESIGNERS/CONSULTANTS**

Project:	INEEL V-Tank Remediation Project			Number of Sheets: 1 of 5	
Site:	INEEL Test Area North, Idaho Falls, Idaho				
Calculation Number:	ABQ06 – CE002		Work Order Number:	12393.002.001	
Subject:	Excavation – Estimated Excavated Soil Volume/Storage Requirements				
Rev #:	Date:	Revision:	Calculated by:	Checked by:	Approved:
RAA		60%	Rob Ederer		
RAB	5/31/01	90%	Rob Ederer	Berg Keshian	Berg Keshian
RAC	6/27/01	90% Polish	Berg Keshian	D. Brennecke	B. Keshian
RAD	9/27/01	Draft Final	Berg Keshian	D. Brennecke	*[signature]* 9/24/01

WESTON
MANAGERS   DESIGNERS CONSULTANTS

SHEET _____ of _____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _B.KesHian_ DEPT _____ DATE _5/31/01_

	APPROVED BY
MATH CHECK BY _____ DEPT _____ DATE _____	
METHOD REV. BY _____ DEPT _____ DATE _____	DEPT _____ DATE _____

Problem Statement:

Estimate the volume of excavated soil, soil container capacity, and quantity of containers.

Method of Solution:

1. Estimate the weight of soil and compare to weight capacity of the bags.
2. Estimate the volume of soil to be excavated.
3. Estimate the number of bags required.

Assumptions:

Average dry soil density if 95.5 pcf.
Average total density is 111 pcf. @ 16.2% muisture content
Soil bag capacity is 258 ~~pcf~~ cubic ft.

Sources of Formulas and References:

INEEL ~~BBWI~~ Engineering Data – Soils test results (see Calculation ABQ05 – CE001)
LiftBag Product Literature
Design Drawings

Calculation:

1. Estimate volume of Soil for TANK Excavation

Depth: 15'   Area: 48 x 26' = 1248 SF

$$Vol = 1248 \times 15 / 27 = 693 \; CY$$

Exclude volume of TANKs to Spring Line

$$\frac{\frac{\pi D^3}{4} \times L}{27} \times \frac{3}{2} = \frac{\frac{3.14 \times 10^2 \times 19.5}{4}}{27} \times \frac{3}{2} = 85 \; CY$$

Volume of Soil = 693 - 85 = | 608 CY | ←

REW 10 05-003 A-5/85

WESTON
MANAGERS   DESIGNERS CONSULTANTS

SHEET _____ of _____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY_____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY
_____
DEPT _____ DATE _____

2. Determine volume of soil for U9 & valve box excavation

Assume depth of 12' depths

Vol = 18' wide x 12' long by 12' deep /27

= 96 cy

Exclude U9 tank and valve box

U9 tank is 400 gal

400 gal / 7.45 gal/cf = 53.69 cf = 2 cy

valve box

6' x 6.5' x 8'/27 = 11.5 cy

Vol Soil = 96 - 2 - 11.5 = $\boxed{82.5 \text{ cy}}$ ⟵

3. Determine volume of soil from pipe removal

Assume lines 7' deep and trenches 3' wide

Assume ~~100~~ 200 of lines ⟋

$\nearrow \dfrac{200}{100}$ x 7' x 3'/27 = $\boxed{\dfrac{156}{~~77.8~~} \text{ cy}}$ ⟵

Neglect volume of pipe

WESTON
MANAGERS DESIGNERS/CONSULTANTS

SHEET _____ of _____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY
DEPT _____ DATE _____

4) Total Volume of Soil to be handled

$$608 + 82.5 + \frac{156}{77.8} = \boxed{\frac{\cancel{768}}{847} \ cy} \leftarrow$$

Assume 20% Expansion

$$\frac{847}{\cancel{768}} \times 1.2 = \boxed{\frac{\cancel{922} \ cy}{1016}} \Leftarrow$$

5) Estimate number of bags

Each bag has volume of 258 cf and 24000 Lb limit

based on unit weight of soil = 111 pcf

$$Capacity \ of \ Bag = \frac{Vol \ bag}{bag \ vol} = \frac{24000 \ lbs/111 = 216.2 \ cf}{258} = 84\%$$

$$216 \ cf/_{27} = 8 \ cy/bag$$

$$\frac{1016}{\cancel{922}} \ cy/_{8} = \boxed{\frac{127}{\cancel{115}} \ bags \ of \ Soil} \leftarrow$$

6. Estimate No of bags for piping

WESTON
MANAGERS DESIGNERS/CONSULTANTS

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY

DEPT _____ DATE _____

Assume Volume of pipe is 80 cf and that pipe

takes up 10 times the space of its volume

$$10 \times 80 = 800 \text{ cf} / 27 = 29.63 \text{ cy}$$

Assume each bag can only be filled to 4.5 cy

∴ 29.63/4.5 = 6.6 bags —

| Assume 7 bags of pipe |

| Total Bags = 122 bags |

134/bags

7. Determine Storage Area for Bags

Assume Stack 2 high

Area of each bag = 52.4 sf

$$\frac{134}{\cancel{122} \text{ bags}}{2} \times 52.4 /\text{bag} = \frac{3511}{\cancel{3196.55}}$$

Size Area as Rectangle

$$\underline{\cancel{40}' \times 80'} = \frac{3600}{\cancel{3200} \text{ sf}}$$
45

* Space Available
5300 sf which
Allows for bag expansion

Discussion

Total Soil Volume $\overset{1016}{\cancel{973}}$ cy

Total Bags 134 $\cancel{122}$ Bags

Soil Container Capacity 8 cy/bag ⟹ $\cancel{85\%}$ 84% Capacity

Storage Area Required 40 × 80' = $\cancel{3200}$ SF
3600 SF

WESTON

MANAGERS   DESIGNERS/CONSULTANTS

SHEET _____ of _____

CLIENT/SUBJECT _____ U TANKS _____

TASK DESCRIPTION _____ TASK NO. _____

W.O. NO. _____

PREPARED BY B. KESHIAN   DEPT _____ DATE 9/27/01

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY

_____

DEPT _____ DATE _____

★ There is the potential that gravel Road
Base within the AOC and Laydown
Areas could become Contaminated and
require bagging for disposal

Drum Storage

$$1' \times 3000\ SF \times \frac{1}{27} = 111\ cy$$

HK Storage

$$\frac{1'}{27} \times (53 \times 53) + \left(\frac{53+15}{2} \times 45\right) = 161\ cy$$

Offsite Access Rd

$$\frac{1}{2} \times 12 \times 113 \times \frac{1}{27} = 25\ cy$$

$$+ \frac{1}{2} \times 20 \times 255 \times \frac{1}{27} = 94\ cy$$

Other Gravel Areas

$$\left[\frac{1}{2} \times 15 \times 703 + \left(\frac{1}{2} \times 23 \times 105\right) + \left(\frac{1}{2} \times 23 \times 45\right)\right] \times \frac{1}{27} = 85\ cy$$

To TAL = 474 cy or

Approx 59 BAgs

WESTON.

MANAGERS DESIGNERS/CONSULTANTS

Project:	INEEL V-Tank Remediation Project			Number of Sheets: 1 of 9	
Site:	INEEL Test Area North, Idaho Falls, Idaho				
Calculation Number:	ABQ07 – CE003		Work Order Number:	12393.002.001	
Subject:	Lifting Requirements				
Rev #:	Date:	Revision:	Calculated by:	Checked by:	Approved:
RAA	4/11/01	60%	R. Ederer	N/A	N/A
RAB	6/1/01	90%	R. Ederer	D. Bennecke	B.Keshian
RAC	6/27/01	90% Polish	D. Brennecke	B. Keshian	B. Keshian
RAD	9/27/01	Draft Final	D. Brennecke	B. Keshian	_(signature)_ 9/27/01

Client/Subject: <u>INEEL-BBWI / V-tank Removal Project</u> W.O. <u>No.:12393.002.001</u>
Task Description: Lifting Requirements   Task: 90% Design Calc
Prepared by: <u>R. Ederer</u>

Problem Statement:

Evaluate the lifting requirements of the V-1, 2, 3, and V-9 tanks. Consider lifting of shipping casks, concrete rad-vault, and soil bags.

Method of Solution:

1. Estimate the tank surface area.
2. Estimate thickness of the steel.
3. Estimate the tank weight.

Assumptions: / DATA Provided by INEEL

1. The tanks are stainless steel (type 304 for this analysis)
2. The V-1, 2, 3 tanks are 10 ft. diameter and 19.5 ft. long.
3. The V-9 tanks is 3.5 ft diameter by 5.5 ft to top of cone section, cone is 1.75' long.

Sources of Formulas and References:

- Grove Hydraulic Crane Product literature
- Design Drawings
- Duratek shipping container and vault literature
- "Lift Liner" system product literature

Calculation:

A. Calculate the expected weight of V-1, V-2, and V-3 Tanks

1. Determine the surface area of the tanks.

$\text{Dia}_{tank} := 10$ $L_{tank} := 19.5$

$\text{Area}_{surface} := \left(\text{Dia}_{tank} \cdot \pi \cdot L_{tank} + 2 \cdot \pi \cdot \frac{\text{Dia}_{tank}^2}{4} \right)$ 785 sf

Assume the tank thickness: $t_{shell} := \frac{0.25}{12}$

2. Determine the tank weight

Steel volume is: $\text{Vol}_{sst} := t_{shell} \cdot \text{Area}_{surface}$ Vol_{sst} 16.35 cf

Assume the density of Type 304 stainless steel is:

$sg_{sst} := 8.04$ $\rho_{sst} := sg_{sst} \cdot 62.4$ ρ_{sst} 501.7 pcf

The tank weight is:

$W_{tank} := \rho_{sst} \cdot Vol_{sst}$ ▮ W_{tank} 8203   lbs

Assume approximately 2" of liquid or sludge left in the tank when lifted.

$s := \dfrac{2}{12}$ $r := 5$ $\alpha := \dfrac{s}{r}$ $\alpha = 0.033$

$W_{liquid} := \left(0.5 \cdot r^2 \cdot \alpha - \sin(\alpha)\right) \cdot L_{tank} \cdot (62.4 \cdot 1.2)$ ▮ $W = 601$ lbs

$\textit{Adujst}$ Adjust tank weight for fittings, flanges, and miscellaeous piping (1,000 lbs).

$W_{tank} := \left(W_{tank} + W_{liquid} + 1000\right)$ $W_{tank} := 9804$ lbs

B. **Estimate the weight of the V-9 tank.** To be conservative and simplify the calculation, assume the cone section is a cylinder.

$Dia_{tank.v9} := 4$ $L_{tank.v9} := 5 + 1.5$

$Area_{surface.v9} := \left(Dia_{tank.v9}^2 \cdot \dfrac{\pi}{2}\right) + L \cdot \left(\pi \cdot Dia_{tank.v9}\right)$ area $:= 101.71$ sf

Assume the tank thickness: $t_{shell} := \dfrac{0.25}{12}$

2. Determine the tank weight

Steel volume is: $Vol_{sst.v9} := t_{shell} \cdot Area_{surface.v9}$ $Vol_{sst.v9} = $ ▮   2.11 cf

Assume the density of Type 304 stainless steel is:

$sg_{sst} := 8.04$ $\rho_{sst} := sg_{sst} \cdot 62.4$ ρ_{sst} 501.7   pcf

The tank weight is:

$W_{tank.v9} := \rho_{sst} \cdot Vol_{sst.v9}$ $W_{tank.v9} = $ ▮ •1063 lbs

Adujst tank weight for fittings, flanges, and miscellaeous piping (500 lbs).

$W_{tank.v9} := W_{tank.v9} + 500$ 1563   lbs

C. Evaluate the lifting requirements for the tanks.   Design lifting for V-1, 2, & 3 tanks

1. In summary, the weight of each tanks is:

V-1, V-2, and V-3 (each):   W.tank =9804 lbs

V-9: $W_{tank.v9}$ = ∎   1563 lbs

2. Assume the tanks are placed in granular fill material (cohesion = 0), with no groundwater therefore neglect the suction required to overcome the capillary forces.

$c := 0$ $c_a := c \cdot 0.9$

3. Add the force to overcome soil friction. Assume the soil rises to the springline of the tank (5').

a. Determine the active soil force on the tank

$\gamma_{soil} := 111 \ pcf$ $H := 5$ $\phi := 32 \cdot deg$

$K_a := \dfrac{1 - \sin(\phi)}{1 + \sin(\phi)}$ $K_a = 0.307$

$P_{vertical} := \gamma_{soil} \cdot H$ = ∎ 555

$P_{active} := K_a \cdot P_{vertical}$ P_{active} = ∎   172   psf

b. Determine the skin friction coefficient on the tank.

$\delta := 17 \cdot deg$ $Ca := 0.9$ $f_o := c_a + P_{active} \cdot \tan(\delta)$ f_o = ∎   53.5 psf

c. Estimate the surface area of the tank in contact with soil.

LⅡD $\dfrac{(19.5 \ x\Pi x 10)}{2}$ s_{tank} = ∎ ·306   sf

d. Estimate the breaking force to overcome the soil friction

$P_{break} := f_o \cdot s_{tank}$ P_{break} = ∎ ·16,387   lbs

4. Estimate the lifting requirement for removing the largest tank.

$Lift_{capacity} := (W_{tank} + P_{break}) \cdot$ ∎ $Lift_{capacity} := 26191$ lbs or 13.1   tons

9804 + 16387

Discussion

Summary of calcs:

weight of each V-1, V-2, and V-3 tanks (tons): $W_{ea.tank} = 4.9$ tons

weight of V-9 tank (tons): $W_{tank.v9}$ 0.781 tons

Tank lifting capacity required (tons) $Lift_{capacity}$ 13.1 tons

Select a Grove RT650E ~~Series~~ Rough Terrrain Hydraulic Crane or equal. A cut sheet is included as Attachment 1. This crane will be adequate for other lifting requirements on the job such as the "Rad Vault 8-120" with loaded HIC (66,700 lbs + 7,500 lbs = 74,200 lbs), DURATEK CNS 8-120B Type B shipping casks (49,300 lbs, empty; 63,980 lbs w/maximum payload) and soil bags (24,000 lbs).
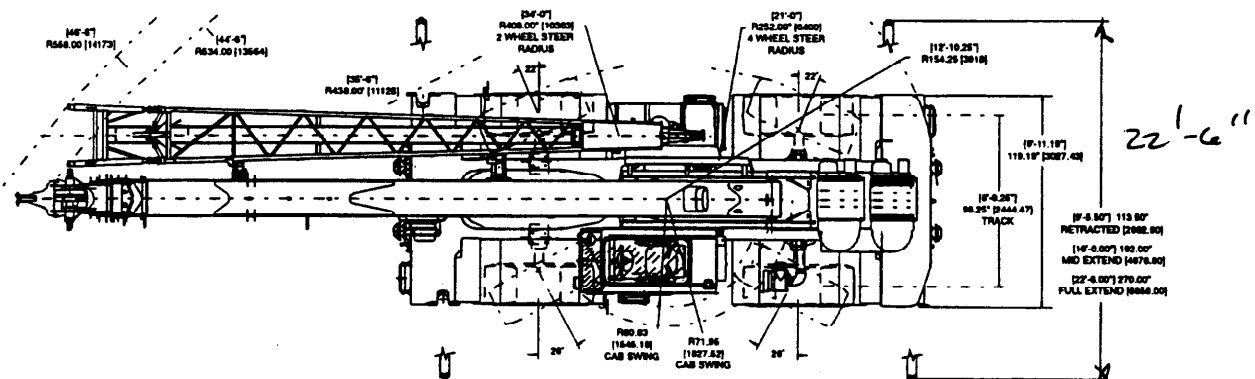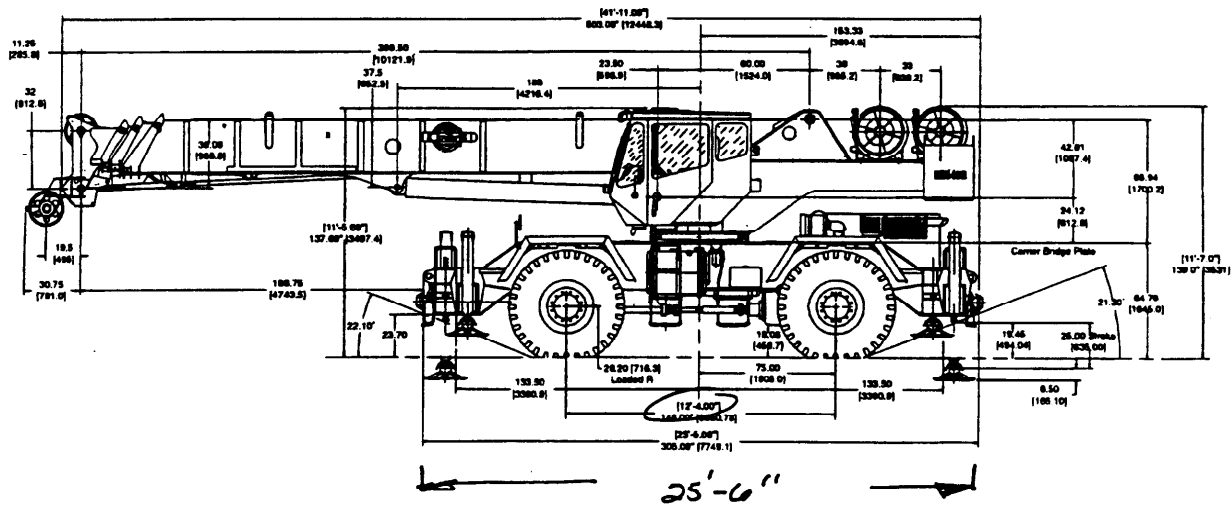
GROVE

RT600E SERIES

ROUGH TERRAIN
HYDRAULIC CRANE

Dimensions

25'-6"

22'-6"

Note: ( ) Reference dimensions in mm

RT650E RATED LIFTING CAPACITIES IN POUNDS
33 FT. - 105 FT. BOOM

ON OUTRIGGERS FULLY EXTENDED - 360°

Radius in Feet	#0001								
	Main Boom Length in Feet								
	33	40	50	60	70	80	90	100	105
10	100,000 (69.5)	80,550 (73.5)	67,250 (77)						
12	87,100 (65.5)	79,150 (70.5)	64,200 (75)	*56,100 (78)					
15	69,050 (59.5)	69,550 (65.5)	59,950 (71)	51,800 (75)	45,200 (77.5)				
20	50,500 (47.5)	50,950 (57)	51,400 (64.5)	44,500 (69.5)	38,550 (73)	34,450 (75.5)	*31,400 (78)		
25	38,300 (32)	38,850 (47)	39,350 (58)	39,650 (64.5)	37,100 (68.5)	29,850 (72)	27,250 (74.5)	21,000 (76.5)	18,350 (77.5)
30		30,700 (34.5)	31,200 (50.5)	31,500 (58.5)	31,700 (64)	26,350 (68)	24,100 (71)	21,000 (73.5)	18,350 (74.5)
35			25,450 (41.5)	25,750 (52.5)	26,000 (59)	23,650 (64)	21,500 (67.5)	19,150 (70)	18,350 (71.5)
40			20,850 (30.5)	21,200 (46)	21,600 (54)	21,350 (59.5)	19,400 (64)	16,650 (67)	17,300 (68.5)
45				17,100 (38)	17,350 (48.5)	17,300 (55)	17,300 (60)	14,650 (64)	15,750 (65.5)
50				13,950 (28)	14,150 (42.5)	14,200 (50.5)	14,200 (56)	13,000 (60.5)	14,300 (62.5)
55					11,700 (35)	11,750 (45.5)	11,850 (52)	11,900 (57)	12,000 (59)
60					9,730 (26)	9,870 (39.5)	9,980 (47.5)	10,100 (53.5)	10,150 (55.5)
65						8,300 (33)	8,440 (42.5)	8,600 (49.5)	8,680 (52)
70						6,960 (24.5)	7,170 (37.5)	7,340 (45.5)	7,430 (48.5)
75							6,080 (31)	6,290 (40.5)	6,390 (44.5)
80							5,130 (23)	5,380 (35.5)	5,490 (40)
85								4,580 (29.5)	4,720 (35)
90								3,880 (22)	4,020 (29)
95									3,400 (21.5)
Minimum boom angle (°) for indicated length (no load)									0
Maximum boom length (ft.) at 0° boom angle (no load)									105

NOTE: ( ) Boom angles are in degrees.
#LMI operating code. Refer to LMI manual for operating instructions.
*This capacity is based on maximum boom angle.

Lifting Capacities at Zero Degree Boom Angle On Outriggers Fully Extended - 360°								
Boom Angle	Main Boom Length in Feet							
	33	40	50	60	70	80	90	100
0°	16,250 (28.2)	12,500 (35)	8,780 (45)	6,290 (55)	4,510 (65)	3,160 (75)	2,110 (85)	1,260 (95)

NOTE: ( ) Reference radii in feet.

A6-829-100936

RT600E SERIES ON RUBBER CAPACITIES

STATIONARY CAPACITIES
360°

Radius in Feet	#9005				
	Main Boom Length in Feet				
	33	40	50	60	70
10	38,550 (69.5)	38,550 (73.5)			
12	32,550 (65.5)	32,550 (70.5)	32,550 (74.5)		
15	23,700 (59.5)	23,700 (65.5)	23,700 (71)	23,700 (75.5)	
20	14,450 (47.5)	14,450 (57)	14,450 (64.5)	14,450 (70)	14,450 (73.5)
25	9,640 (32)	9,640 (47)	9,640 (58)	9,640 (65)	9,640 (69.5)
30		6,840 (34.5)	6,840 (50)	6,840 (59)	6,840 (64.5)
35			4,850 (41.5)	4,850 (53)	4,850 (60)
40			3,450 (30.5)	3,450 (46.5)	3,450 (54.5)
45				2,410 (38.5)	2,410 (49)
50				1,610 (28.5)	1,610 (43)
Min. boom angle (°) for indicated length (no load)					30
Max. boom length (ft.) at 0° boom angle (no load)					60

NOTE: ( ) Boom angles are in degrees.
#LMI operating code. Refer to LMI manual for operating instructions.

Lifting Capacities at Zero Degree Boom Angle On Rubber - 360°					
Boom Angle	Main Boom Length in Feet				
	33	40	50		
0°	7,580 (28.2)	4,850 (35)	2,410 (45)		

NOTE: ( ) Reference radii in feet.   A6-829-100836A

STATIONARY CAPACITIES
DEFINED ARC OVER FRONT (See Note 3)

Radius in Feet	#9005				
	Main Boom Length in Feet				
	33	40	50	60	70
10	46,600 (69.5)	40,800 (73.5)	34,600 (77)		
12	40,800 (65.5)	40,800 (70.5)	34,600 (74.5)		
15	34,000 (59.5)	34,000 (65.5)	34,000 (71)	26,650 (75.5)	21,500 (78)
20	26,050 (47.5)	26,050 (57)	26,050 (64.5)	26,050 (70)	21,500 (73.5)
25	18,200 (32)	18,200 (47)	18,200 (58)	18,200 (65)	18,200 (69.5)
30		13,100 (34.5)	13,100 (50)	13,100 (59)	13,100 (64.5)
35			10,050 (41.5)	10,050 (53)	10,050 (60)
40			7,900 (30.5)	7,900 (46.5)	7,900 (54.5)
45				6,290 (38.5)	6,290 (49)
50				5,050 (28.5)	5,050 (43)
55					4,060 (35.5)
60					3,260 (26.5)
Min. boom angle (°) for indicated length (no load)					0
Max. boom length (ft.) at 0° boom angle (no load)					70

NOTE: ( ) Boom angles are in degrees.
#LMI operating code. Refer to LMI manual for operating instructions.

Lifting Capacities at Zero Degree Boom Angle On Rubber - Defined Arc Over Front					
Boom Angle	Main Boom Length in Feet				
	33	40	50	60	70
0°	14,550 (28.2)	10,050 (35)	6,290 (45)	4,060 (55)	2,590 (65)

NOTE: ( ) Reference radii in feet.   A6-829-100835A

WESTON
MANAGERS DESIGNERS/CONSULTANTS

Project:	INEEL V-Tank Remediation Project			Number of Sheets: 1 of 8	
Site:	INEEL Test Area North, Idaho Falls, Idaho				
Calculation Number:	ABQ08 – CE004		Work Order Number:	12393.002.001	
Subject:	Drum Storage/Water Storage/Decontamination Area Secondary Containment Requirements				
Rev #:	Date:	Revision:	Calculated by:	Checked by:	Approved:
RAA		60%	R. Ederer		
RAB	5/31/01	90%	R. Ederer	B. Keshian	B. Keshian
RAC	6/29/01	90% Polish	D. Brennecke	B. Keshian	B. Keshian
RAD	9/27/01	Draft Final	D. Brennecke	B. Keshian	Jim Lockhart
RAE	10/23/01	Draft Final Polish	D. Brennecke	B. Keshian	Jim Lockhart 10/24/01

WESTON
MANAGERS   DESIGNERS/CONSULTANTS

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY
DEPT _____ DATE _____

Problem Statement:

Estimate the containment ~~area~~ **volume** required for ~~storage~~ of contaminated liquids.
secondary containment

Method of Solution:

1. Determine the area needed for containers.
2. Determine the volume need for 25 yr / 24 hr storm.
3. Determine volume of liquids in containers.
4. Design containment berm with a capacity to contain the volume of contaminated liquids & 25 yr/24 hr. storm.

Sources of Information:

Design Drawings
Design information from Bartlett, INEEL and BBWI

NOAA ATLAS 2, Vol V, ISOPLUVIALS OF 25 yr /24 hr. Precipitation in tenths of AN INCH
TR-55

Assumptions:

$$CN = 79$$

$$S = \frac{1000}{CN} - 10$$

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

DETERMINATION OF WATER SOURCES

Item	Value	Units
Sources of water		
V-1	1164	gallons
V-2	1076	gallons
V-3	7648	gallons
V-9	70	gallons
Decon	2000	gallons
Runoff	15000	gallons
Rinse	500	gallons
Total water volume	27458	gallons

WESTON
MANAGERS   DESIGNERS/CONSULTANTS

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

| APPROVED BY |
| DEPT _____ DATE _____ |

Assumptions. Con't

- Contain 100% volume of the largest container or 10% of total storage volume plus volume of 25 YR 24 HR storm per 40 CFR 264.175b3

- Total storage volume:

  Decon, Runoff, Rinse, Tank water $\approx$ 30,000 GALLONS

- Largest container will be 10,000 GAL water tank
  (12' ϕ × 14' HIGH) Area req'd = $\pi 6^2$ = 113 SF/TANK

- ESTIMATED AREA OF CONTAINMENT AREA FROM DRAWINGS

  $\approx$ 6,000 SF × $\dfrac{MI^2}{(5280\ FT/M)^2}$ = 0.000215 mi^2

Calculations:

Volume of Stormwater from within containment area

$$V_{AC\ FT} = Q * Am * 53 * 33$$

$$Am = \text{Area in } mi^2$$

$$Q = \frac{(P_{25} - 0.2S)^2}{(P + 0.8S)}$$

$$S = \frac{1000}{CN} - 10 \implies S = \frac{1000}{79} - 10 = 2.66$$

$$P_{25} = 2.0$$

$$Q = 0.522\ in$$

$$V = 0.522 \times 0.000215\ mi^2 \times 53.33$$

$$= 0.005985\ AC\text{-}FT \times \frac{43,560\ SF}{AC} = 260.7\ CF$$

$$= 260.7\ CF \times \frac{7.48\ ga}{CF}$$

$$= 1950\ GAL \impliedby$$

Storage Volume Req'd

$$Vol = Tank + 25\ yr\ 24\ HR\ STORM$$

$$= 10,000\ GAL + 1950\ GAL$$

$$= 11,950\ GAL \impliedby$$

WESTON
MANAGERS DESIGNERS/CONSULTANTS

CLIENT/SUBJECT _INEEL V-TANK_

W.O. NO. _____

TASK DESCRIPTION _RECALCULATE SIZE OF DRUM STORAGE AREA_ TASK NO. _____

PREPARED BY _DFB_ DEPT _____ DATE _8/14/01_ / _10/22/01_

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY
_____
DEPT _____ DATE _____

ASSUMPTIONS

- DRUMS ARE MOVED DIRECTLY TO INTERIM STORAGE AFTER FILLING
  AND NO MORE THAN 10 DRUMS ARE STORED IN DRUM STORAGE
  AREA AT ONE TIME

- DRUM STORAGE AREA IS $25^{\square'}$/DRUM

- 10,000 GAL H_2O STORAGE TANKS (12'Ø) REQUIRE $\pi 6^2 = 113 \, SF$/TANK

- 30% ADDITIONAL AREA REQD FOR LOGISTICS

- 10,975 GAL OF SECONDARY CONTAINMENT STORAGE IS REQD (AB908RAC)
  (10,000 GAL + 19.75% = 10,975) ASSUMES 3,000 SF AREA CATCHES STORM WATER

CALCULATE AREA REQD

DRUMS	$25^{\square'}$/DRUM × 10 DRUMS	=	$250^{\square'}$
10,000 GAL WATER STORAGE	113 SF/TANK × 3 TANKS	=	$\frac{226^{\square'}}{337^{\square'}}$
1,000 GAL WATER CONTAINER (6'×14.5 = $87^{\square'}$)	87 SF/TANK × 10 TANKS		$\overline{870^{\square'}}$ $\overline{889^{\square'}}$ 1346
	+30% LOGISTICS		$177^{\square'}$ 404
			$766^{\square'}$ $1750^{\square'}$
	ACCESS ROAD 12'×60'		$720^{\square'}$ $2800^{\square'}$
			$1486^{\square'} \approx 1500^{\square'}$ ←
			2470

CALCULATE MIN AREA REQD ASSUMING MINIMUM STORAGE DEPTH
OF 1 FOOT

$$10,975 \, GAL \times \frac{ft^3}{7.48 \, gal} \times \frac{1}{1 \, ft} = 1,467^{\square'} \quad MIN \, AREA \quad REQD$$

⇒ MINIMUM DIMENSIONS OF AREA = $\sqrt{1500}^{\square'} = 38.7'$

∴ MAKE AREA 50' × 60' TO ACCOMMODATE
SEMI TRACTOR TRAILOR DECON

10 0 10 20 30 40
═══ MILES

IDAHO

Figure 28

ISOPLUVIALS OF 25-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

NOAA ATLAS 2, Volume V

Prepared by U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service, Office of Hydrology

Prepared for U.S. Department of Agriculture,
Soil Conservation Service, Engineering Division